Topology Optimised Photonic Crystal 1x4 Waveguide Splitter

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A photonic crystal waveguide (PhCW) 1x4 splitter has been constructed from PhCW 60° bends [1] and Y-splitters [2] that have been designed individually by utilising topology optimisation [3]. The splitter has been fabricated in a silicon-on-insulator material (Fig. 1) and exhibits a broadband splitting for the TE-polarisation with an average excess loss of 1.55±0.54 dB for a 110 nm bandwidth (Fig. 2). The 1x4 splitter demonstrates that individual topology-optimised parts can be used as building blocks to realise high-performance nanophotonic circuits.

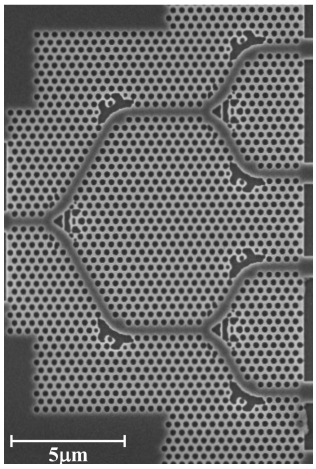

Fig. 1 SEM picture of the splitter.

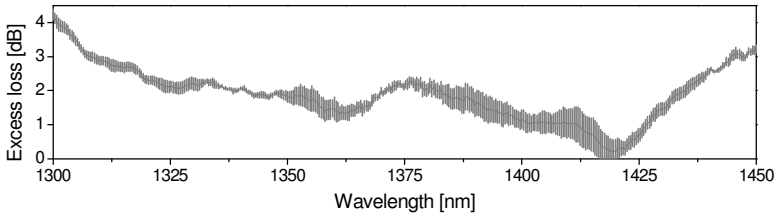

Fig. 2 Normalised transmission spectrum from the 1x4 splitter. The error bars express the variation in the measured transmission from the different output arms.

[1] L.H. Frandsen *et al.*, *Optics Express*, **12**, pp. 5916-5921 (2004).
[2] P.I. Borel *et al.*, to appear in *Electron. Lett.* (2005).
[3] J.S. Jensen and O. Sigmund, *App. Phys. Lett.*, **84**, pp. 2022-2024 (2004).